CLINICAL STUDY

Fluoroscopic Guide Wire Manipulation of Malfunctioning Peritoneal Dialysis Catheters Initially Placed by Interventional Radiologists

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ABSTRACT

Purpose: To assess the efficacy of fluoroscopic guide wire manipulation in patients with malfunctioning peritoneal dialysis (PD) catheters that were initially placed by interventional radiologists under fluoroscopic guidance.

Materials and Methods: From January 2002 to April 2012, 52 patients (mean age, 52.8 y ± 2.10s; range, 12–79 y) with malfunctioning PD catheters in whom fluoroscopic guide wire manipulation was performed were retrospectively reviewed. Technical success, clinical success, and complications were evaluated. Technical success was defined as fluoroscopically verified, successful catheter repositioning and adequate dialysate drainage after the procedure. Clinical success was defined as maintenance of PD catheter function for at least 30 days after the manipulation.

Results: During the study period, 72 manipulations (68 initial manipulations and 4 remanipulations) for malfunctioning PD catheters were done. The technical success rate was 74% (50 of 68) for initial manipulations and 75% (3 of 4) for remanipulations. The overall clinical success rate was 47% (32 of 68) for initial manipulations and 0% (0 of 4) for remanipulations. The primary causes of catheter malfunction were extraluminal obstruction by omental wrapping or adhesions in 43 of 68 cases (63.2%) and catheter malposition in 25 of 68 (36.8%) cases. There were no procedure-related major complications.

Conclusions: Fluoroscopic guide wire manipulation in patients with malfunctioning PD catheters initially placed by interventional radiologists is a simple procedure, an effective way of prolonging PD catheter life, and a recommended procedure before invasive surgical procedures.

ABBREVIATIONS

IM = initial manipulation, PD = peritoneal dialysis, RM = remanipulation

Continuous ambulatory peritoneal dialysis (PD) is an increasingly popular alternative to hemodialysis in the treatment of chronic renal failure. The number of patients receiving PD is continuously increasing worldwide (1–3). However, several catheter-related problems may occur, including dialysate leak, peritonitis, exit-site infection, malfunction secondary to malposition of the PD catheter, intraluminal obstruction by fibrin strands or blood clots, and extraluminal obstruction by omental wrapping or adhesions (4–8). Of these, the most significant problems associated with PD are catheter malfunction secondary to catheter malposition and extraluminal obstruction (3,9,10). Catheter malfunction develops in 3.9%–33% of patients with a PD catheter, and malfunction is a cause of serious morbidity because it precludes further continuation of dialysis and leads to incomplete or painful dialysis unless the catheter is replaced or repaired (2,5–7,9–12).

Conservative approaches, including body position change, saline infusion, or the use of laxatives or enemas, were initially tried for malfunctioning PD catheters (3,10). Following failure of conservative measures to restore catheter function, various treatment modalities have been described, including urokinase installation

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with Fogarty catheter manipulation (13), fluoroscopic manipulation using a stiff wire (3–5,14,15), a malleable aluminum bar (16), and a stiff rod (6,9,17) as well as surgical methods including laparoscopy (10,12,18). However, the success rates of different methods vary, and there are no specific clinical indications or standard techniques for repairing malfunctioning catheters. Most catheters in the previously cited studies were placed by surgical techniques. A more recent report showed that only 5.3% of all catheter placements are performed by interventional radiologists (19). In this study, we review our experience with fluoroscopic guide wire manipulation in patients with malfunctioning PD catheters that were initially placed by interventional radiologists under fluoroscopic guidance.

MATERIALS AND METHODS

This retrospective study was approved by the institutional review board of our hospital. During January 2002 to April 2012, 352 patients underwent first-time fluoroscopic PD catheter placement. All fluoroscopic PD catheter placements and wire manipulations for malfunctioning catheters were performed by two experienced interventional radiologists (with 8 and 17 years of experience). Double-cuff straight (n = 89, from January 2002 to February 2005) or spiral (n = 263, from March 2005 to April 2012) Tenckhoff catheters were used in all 352 patients. Of these patients, 52 (14.8%) in whom fluoroscopic guide wire manipulation was performed for malfunctioning PD catheters were retrospectively reviewed.

PD catheters were usually placed in the left lower abdomen unless the patient had a prior catheter or a surgical scar in that location. After infiltrating the skin and the underlying tissue with 1% lidocaine as local anesthesia, a primary incision of approximately 2 cm in length was made at least 2–4 cm superior and 4 cm lateral to the umbilicus to prevent injury to the inferior epigastric artery. The PD catheter was placed deep in the pelvic cavity under fluoroscopic control after successful puncture of the peritoneum using a puncture needle and placement of a 0.035-inch guide wire (Radiofocus M; Terumo, Tokyo, Japan) into the pelvis. A subcutaneous tunnel was created using a tunneling stylet, forming an angle downward to the primary incision so that it faced anterosuperior to the iliac spine (**Fig 1**). Successful insertion was defined as adequate peritoneal catheter function for inflow and outflow of dialysate in the period immediately after insertion, and the catheter was considered to have adequate drainage when dialysate flowed in a continuous steady stream and drained 80% of the injected volume within 15 minutes. A malfunctioning PD catheter was defined as one that had poor drainage or poor inflow or caused pain, or any combination of these, and there was no evidence of pericatheter leakage. In the event of catheter malfunction, all patients initially received conservative measures such as position change, recurrent catheter flushes with heparinized saline, and use of laxatives or enemas. If conservative measures failed, patients with malfunctioning catheters were referred to the interventional radiology suite for contrast evaluation of the catheter to document its position and determine whether extraluminal obstructions were limiting the infusion or return of the dialysate.

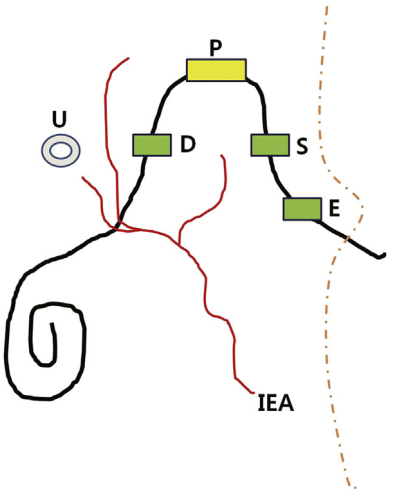

Figure 1. Schematic representation of the location of the fluoroscopy-guided PD catheter. D = deep cuff; E = exit site; IEA = inferior epigastric artery; P = primary incision; S = superficial cuff; U = umbilicus. (Printed with permission of Peritonial Dialysis International.) (Available in color online at *www.jvir.org*.)

When the PD catheter tip had migrated and was incorrectly located from its original pelvic location without significant pericatheter contrast stasis, the primary cause for catheter malfunction was classified as catheter malposition. When the contrast study showed complex filling defects and contrast stasis around the PD catheter regardless of its position, the primary cause for catheter malfunction was classified as extraluminal obstruction by omental wrapping or adhesions. After that, it was also requested that a fluoroscopic guide wire manipulation be performed to disrupt or displace extraluminal obstruction and reposition the catheter tip more favorably (9,10,16).

For fluoroscopic guide wire manipulations, all PD catheters and catheter exit sites were prepared and draped in a sterile fashion, and meticulous aseptic technique was used. Routine prophylactic antibiotics were not administered, and patients were not premedicated with sedatives or analgesics unless they were extremely apprehensive. When necessary, patients received 2 mg midazolam hydrochloride and 50–100 μg fentanyl citrate for conscious sedation. Because many patients had poor outflow, the peritoneal cavity was often filled with several hundred milliliters of dialysate. However, if the peritoneal cavity was empty at the